



# Proposed Revisions to Climate Change Analyses in WSIP Regulations



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DWR

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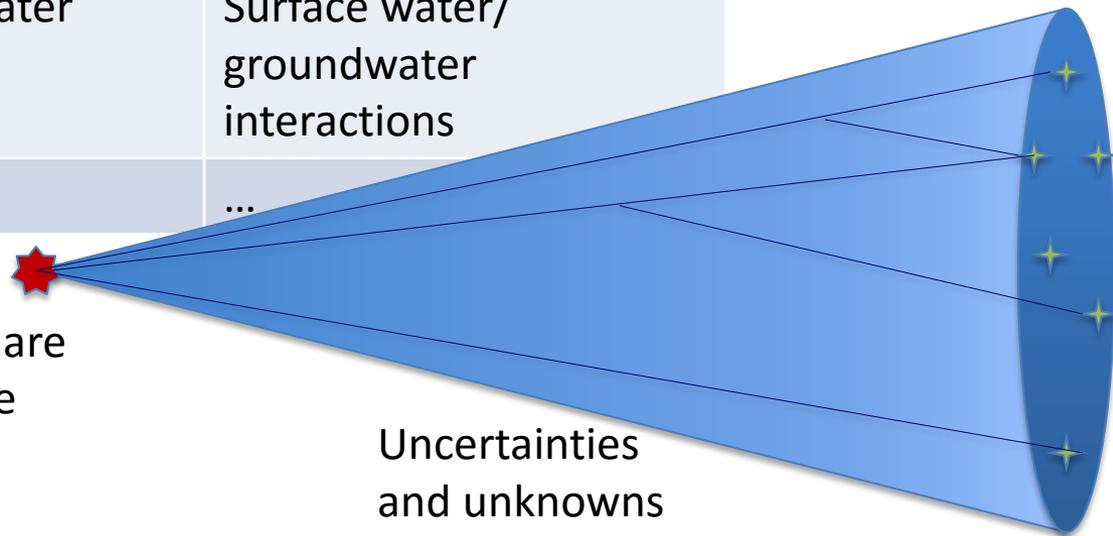
# Different Kinds of Uncertainty:

| We know these will change and we have some idea of how they will change: | We know these will change but we aren't sure exactly how they will change: | Systematic/ Modeling Error                    |
|--|--|---|
| Climate  | Regulations/<br>Operational constraints                                    | Climate model<br>downscaling                  |
| Sea level rise   | Infrastructure   | Hydrologic modeling                           |
| Population   | Technology<br>improvements   | Operational modeling                          |
| Land use   | Agricultural water<br>efficiency   | Surface water/<br>groundwater<br>interactions |
| ...  | ...  | ...   |

We are here

Uncertainties  
and unknowns

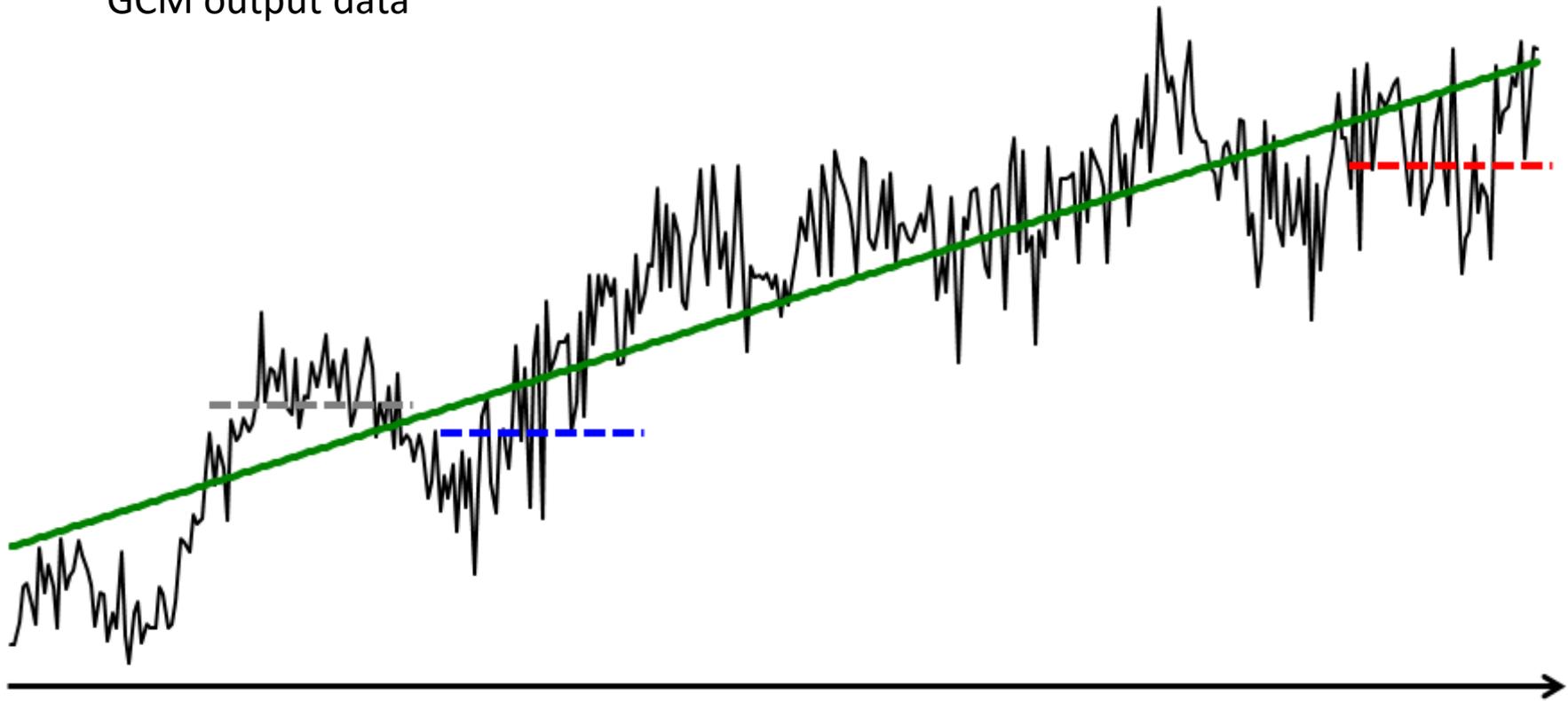
Future



# Typical climate change projection....

GCM output data

Impact



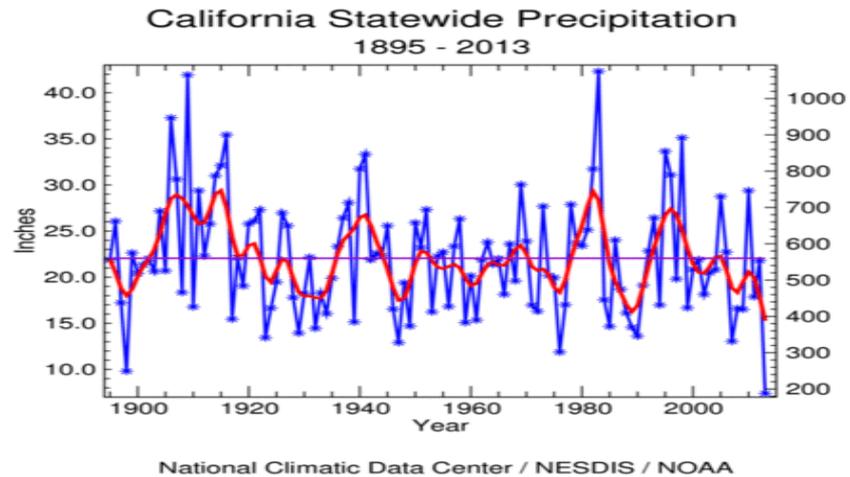
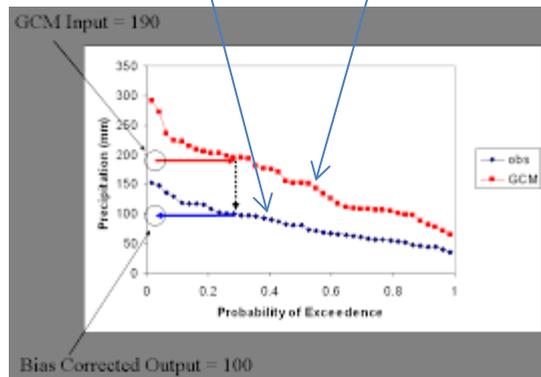
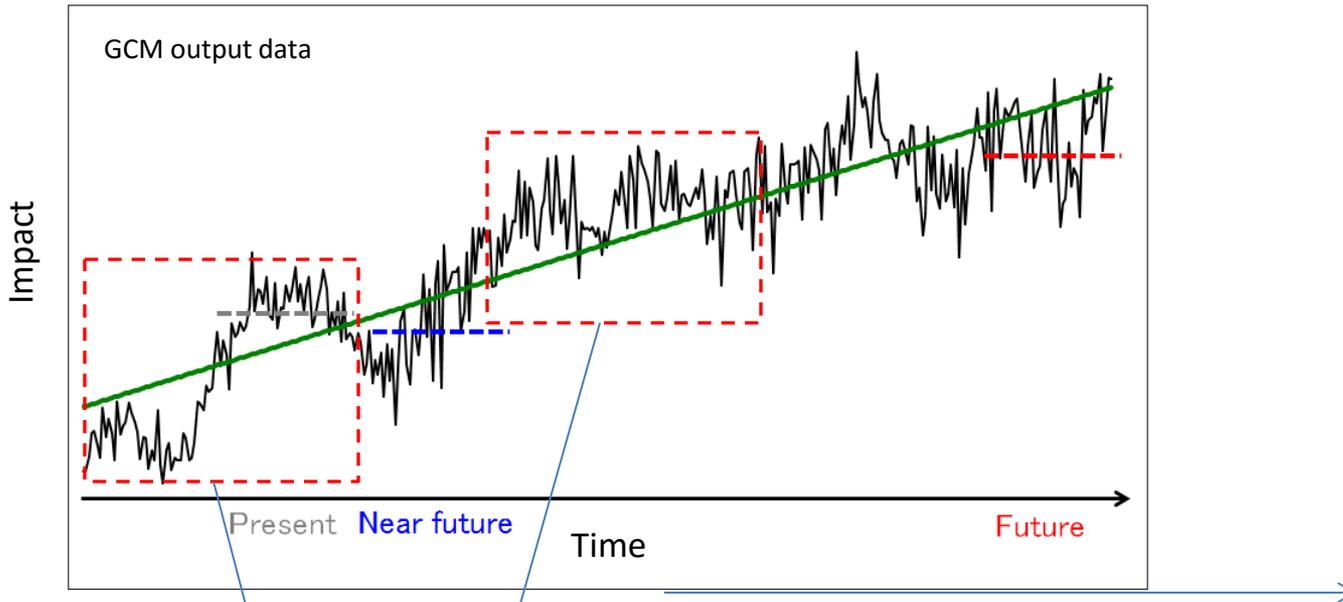
Present

Near future

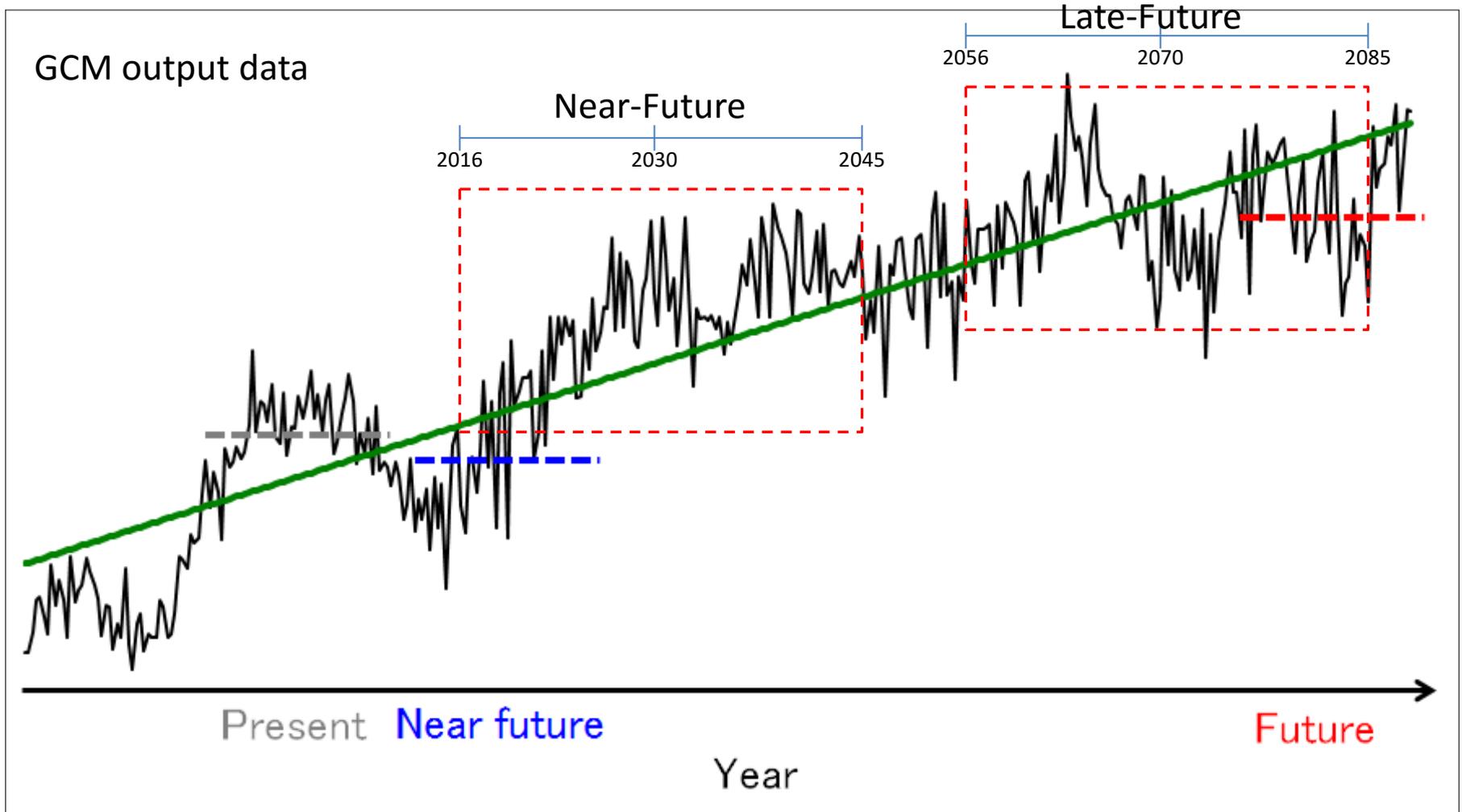
Year

Future

# How We Use Climate Information

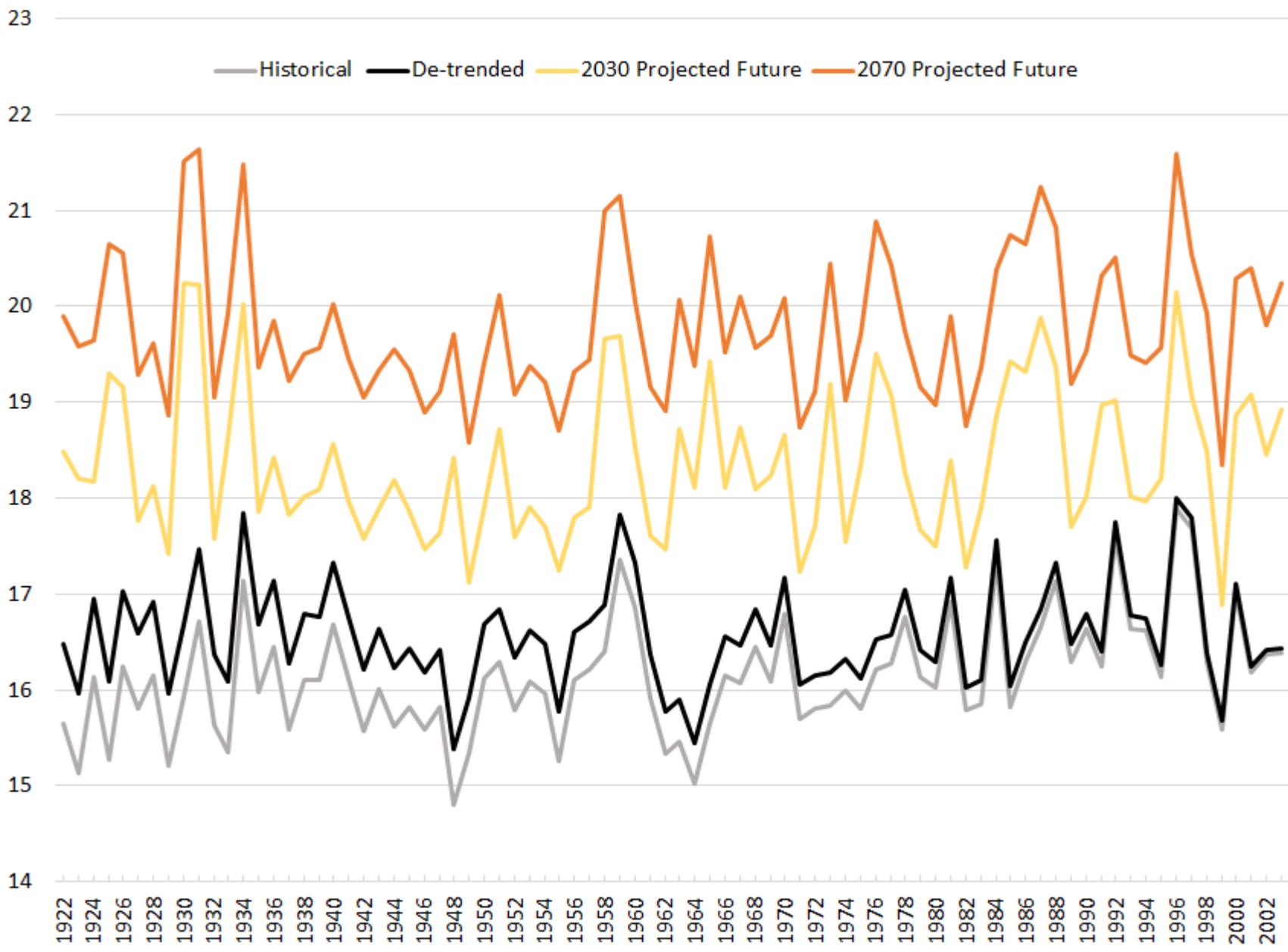


# “Near-term” and “Late-term” Futures



Average Temperature (deg C)

Historical De-trended 2030 Projected Future 2070 Projected Future



# So What will the Applicants get?

## For Both “Near-Future” and “Late-Future” Scenarios

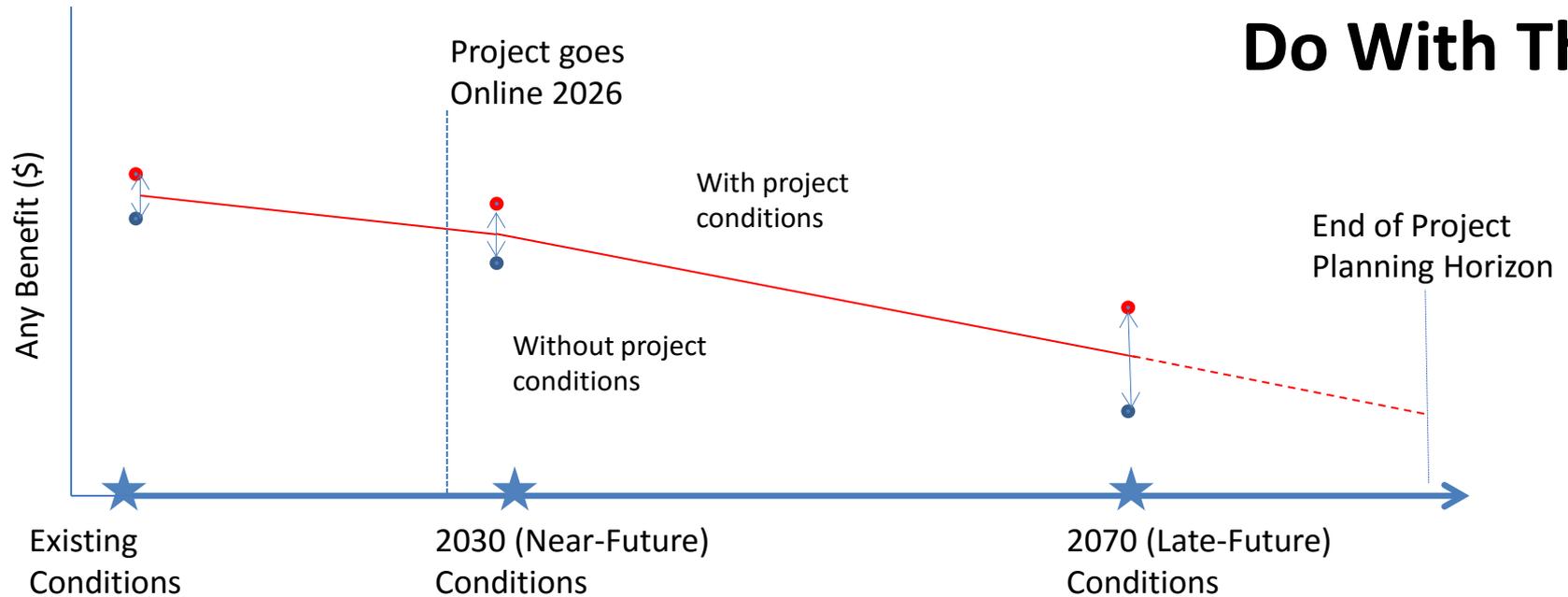
- 82-year gridded monthly Temperature and Precipitation across the entire state
- 82-year gridded monthly hydrologic runoff terms
- 82-year monthly streamflows for Central Valley rivers
  
- 82-year monthly CalSim-II model code and results
- DSM2 model codes and results

Consistency

Ease of Use

Easily Comparable

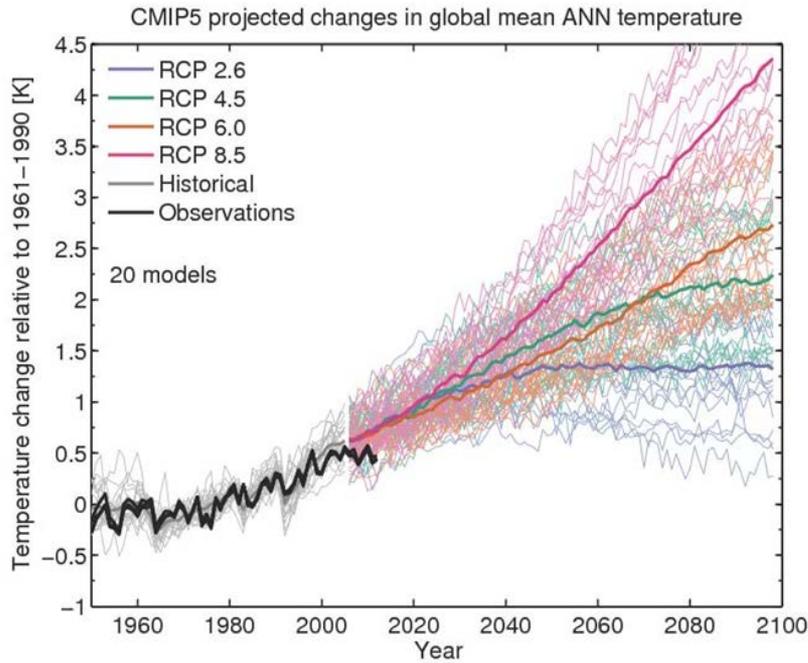
# So What Will the Applicants Do With This?



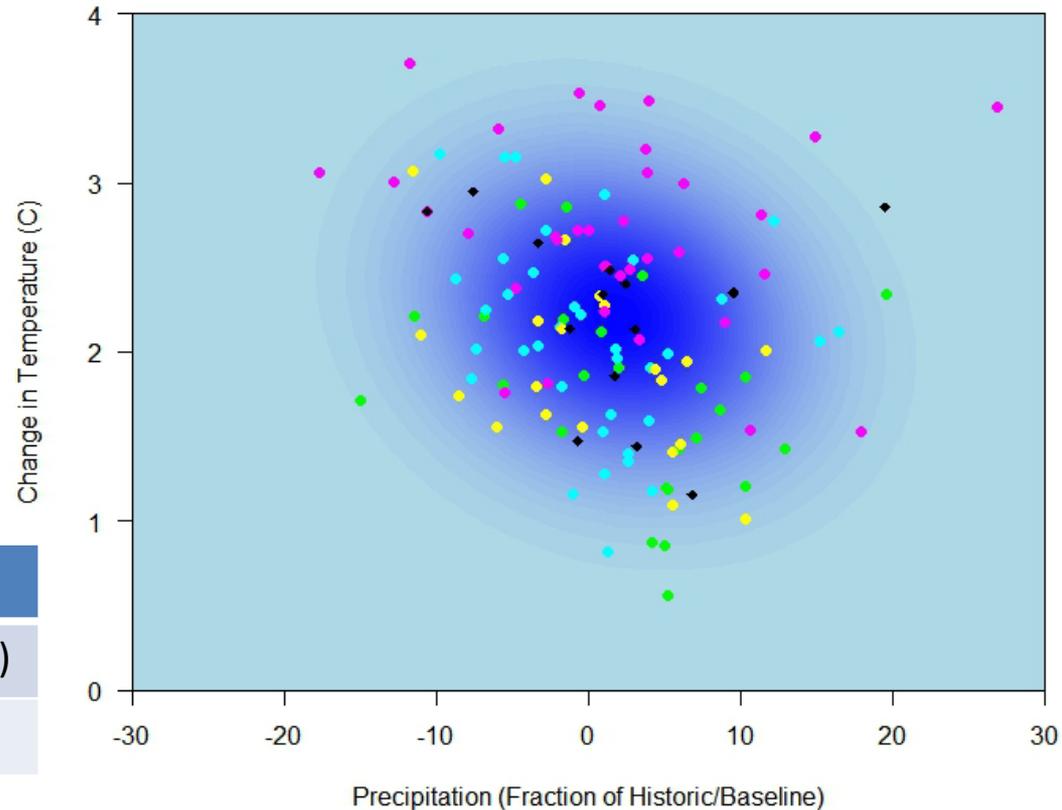
| Year | Change in Benefits | Discount |
|------|--------------------|----------|
| 2026 | \$4,000            | 1.460    |
| 2027 | \$4,050            | 1.511    |
| 2028 | \$4,100            | 1.564    |
| 2029 | \$4,150            | 1.619    |
| 2030 | \$4,200            | 1.675    |
| 2031 | \$4,300            | 1.734    |
| 2032 | \$4,400            | 1.795    |
| ...  | ...                | ....     |

$$NPV = -\text{Cost} + \sum \frac{(\text{benefits}_i)}{(1+\text{rate})^i}$$

# Uncertainty in Climate Projections

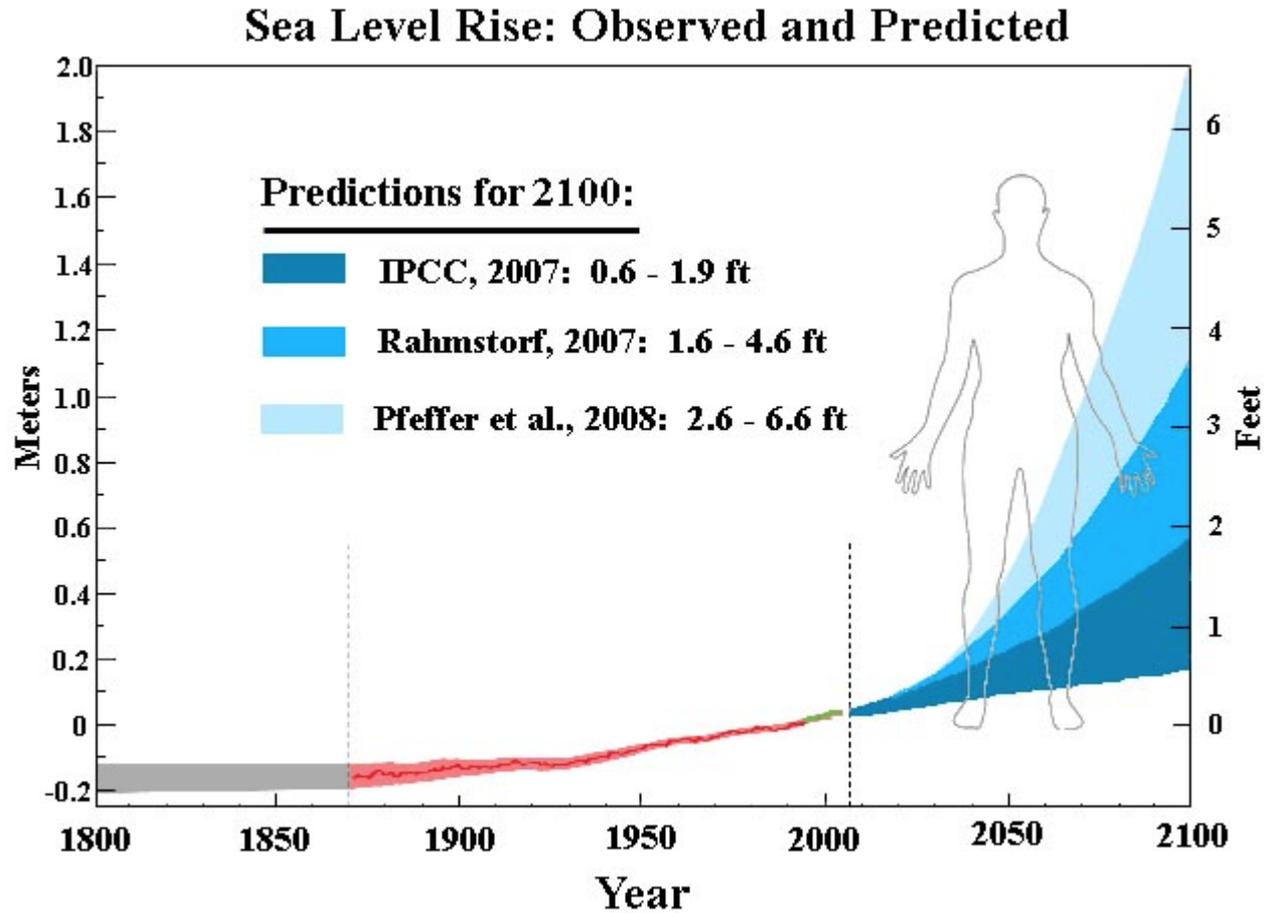


Mid-Century Climate Probability Space

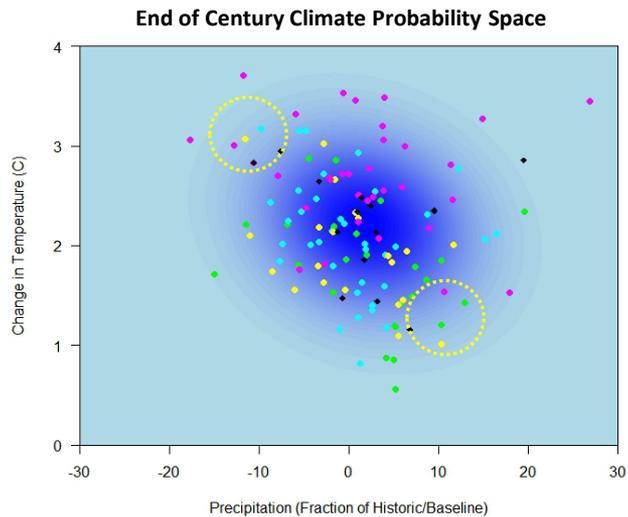
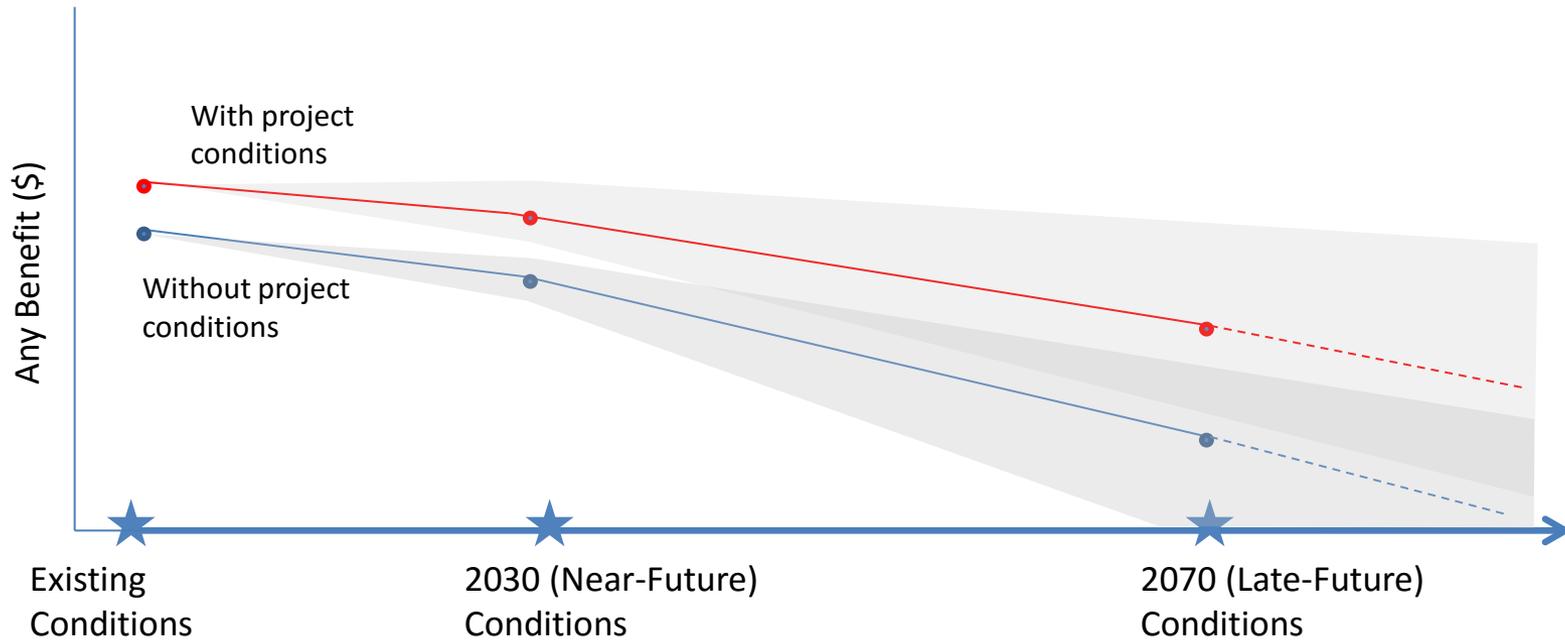


|               | Lowest         | Highest        |
|---------------|----------------|----------------|
| Temperature   | +0.5 C (1.0 F) | +3.7 C (6.7 F) |
| Precipitation | -18%           | +26%           |

# Uncertainty in Sea Level Rise Projections



# Uncertainty in the Performance of Projects



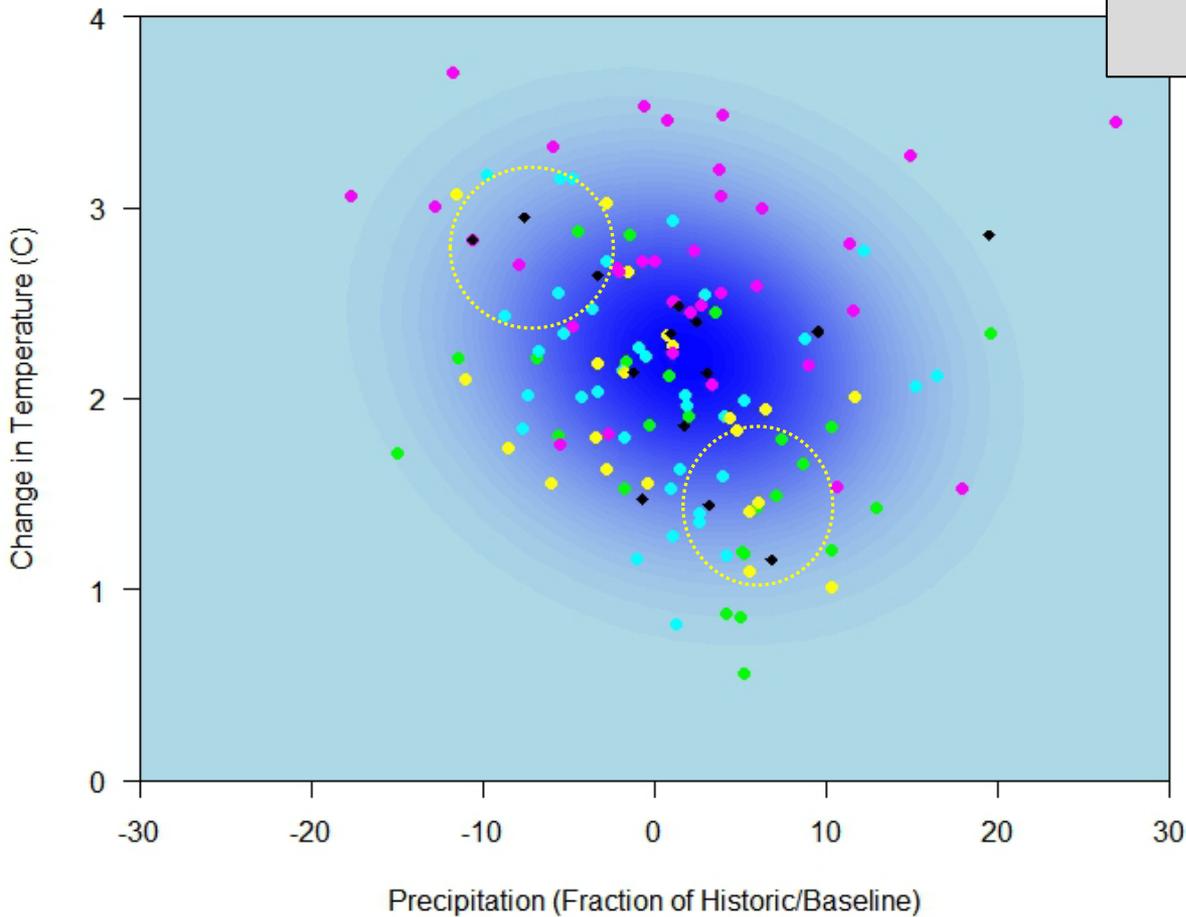
## Sensitivity Analysis of Highly Challenging Future Conditions

- Extreme warming/Extreme Drying
- Minimal warming/Extreme Wetting

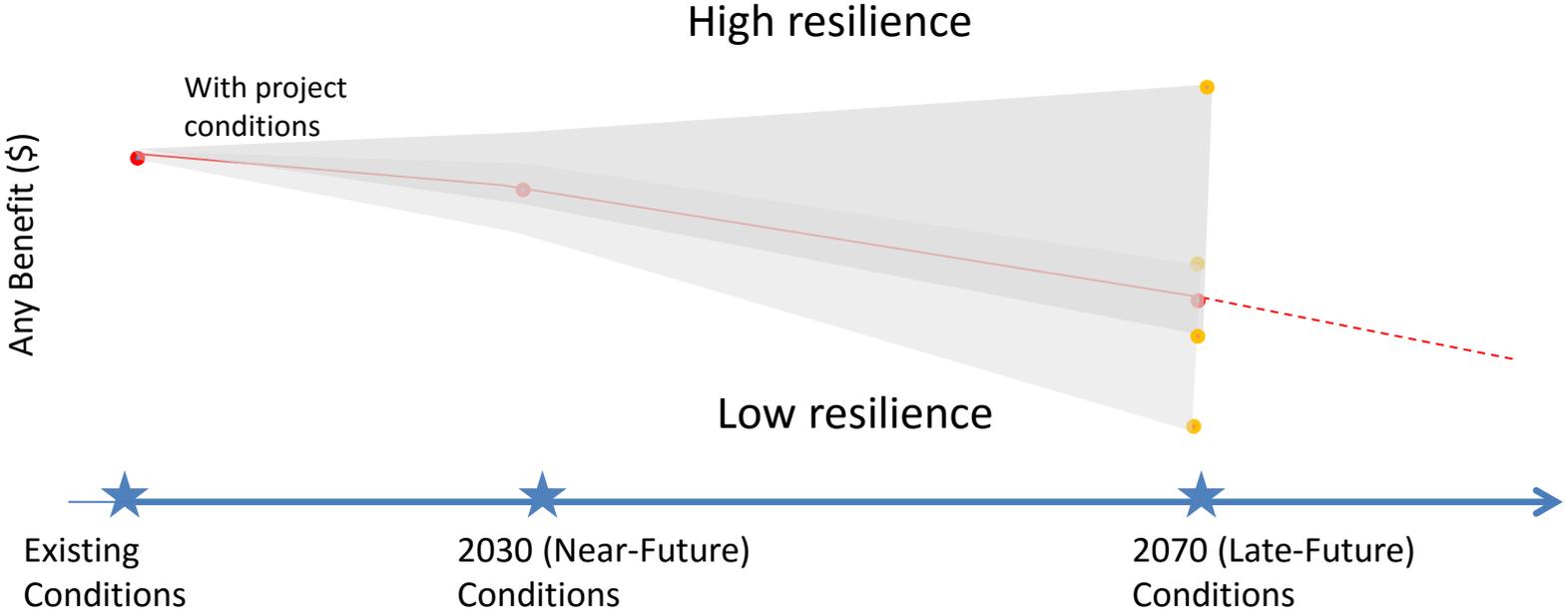
## Sensitivity Analysis of Highly Challenging Future Conditions

- Extreme warming/Extreme Drying
- Minimal warming/Extreme Wetting

End of Century Climate Probability Space



# Sensitivity Analysis



# Risk Informed Decision

- All projects must analyze the same conditions making comparisons more fair
- Net Present Value of project calculated over life of the project using the best available tools for projecting future conditions
- Future benefits are less certain, those benefits are discounted so that they are less important than near-term benefits
- Sensitivity Analysis provides a measure of the resiliency of the project to future conditions

